

Foodborne diseases: CDC Roles

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Centers for Disease Control and Prevention

Centers for Disease Control and Prevention

- Agency of the U. S. Public Health Service
- Established in Atlanta in WW2 to control malaria. Result: malaria eradicated
- 1948: Enteric reference laboratory established
- 1950's: Emergency response mission; the Epidemic Intelligence Service created.
- Non- regulatory - provide independent scientific assessment to the regulatory agencies
- Epidemiologists, microbiologists, statisticians, and other public health professionals
- CDC Vision: Healthy people in a healthy world

Our public health infrastructure

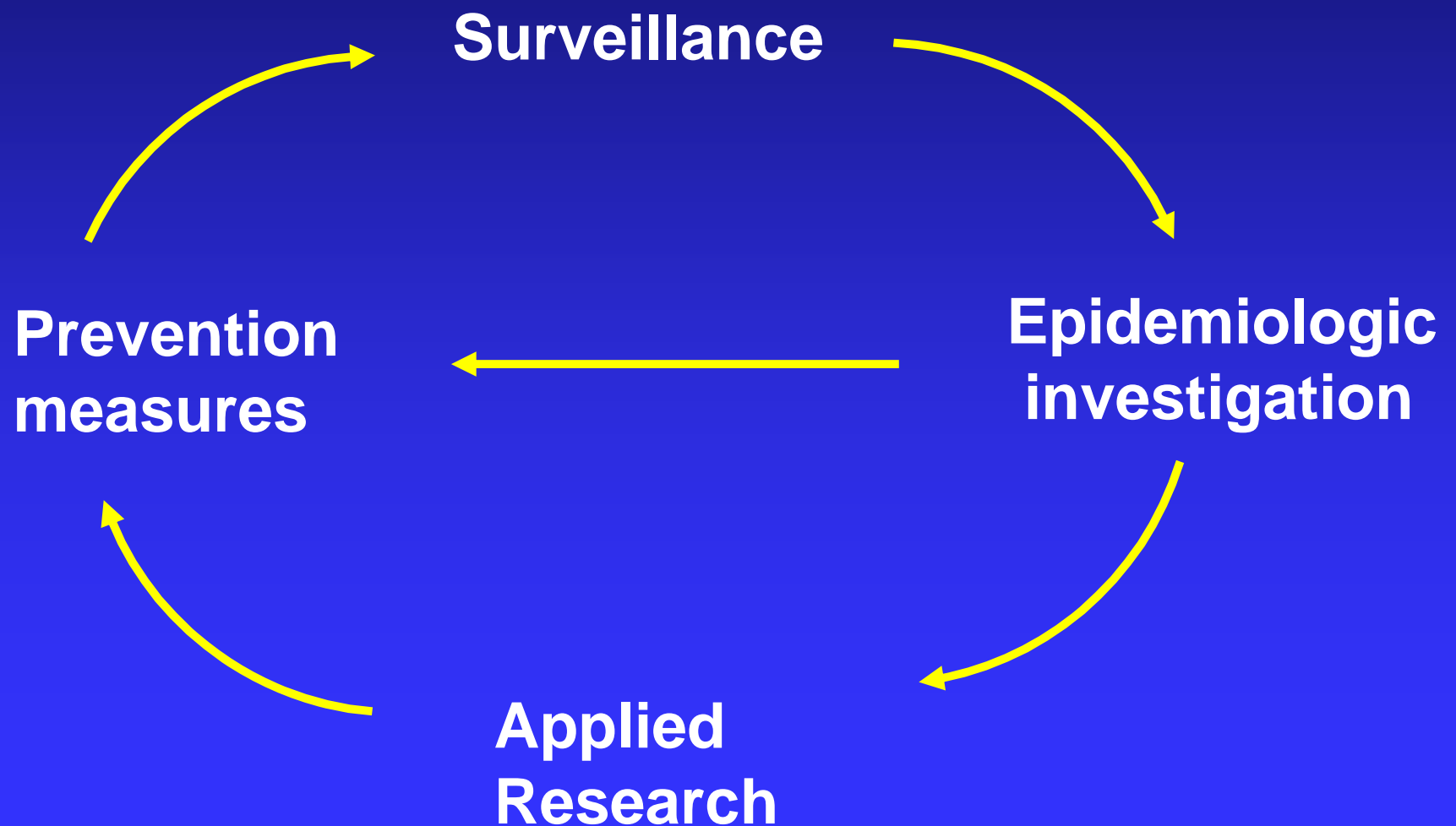
- The county or city health department
 - The front line of public health
- The State Health department
 - Epidemiologists
 - Laboratorians
 - Sanitarians
- The federal agencies:
 - Risk identification agency: CDC
 - Risk management/regulatory agencies: FDA, USDA, EPA
- "Tiered response" to emergencies. CDC provides back-up to States: epidemiologists, laboratory support, coordination

Foodborne disease - 2007

a continuing public health concern

- **76 million cases of foodborne disease each year, and 5,000 deaths**
- **1200 outbreaks reported each year**
- **Outbreaks a small part of problem; most reported cases are "sporadic"**
- **Changes in pathogens themselves, in environment, in tastes, and in human behavior leads to new problems**
- **New problems need new strategies for surveillance and prevention**
- **Prevention requires many groups from farm to table**

The cycle of public health prevention



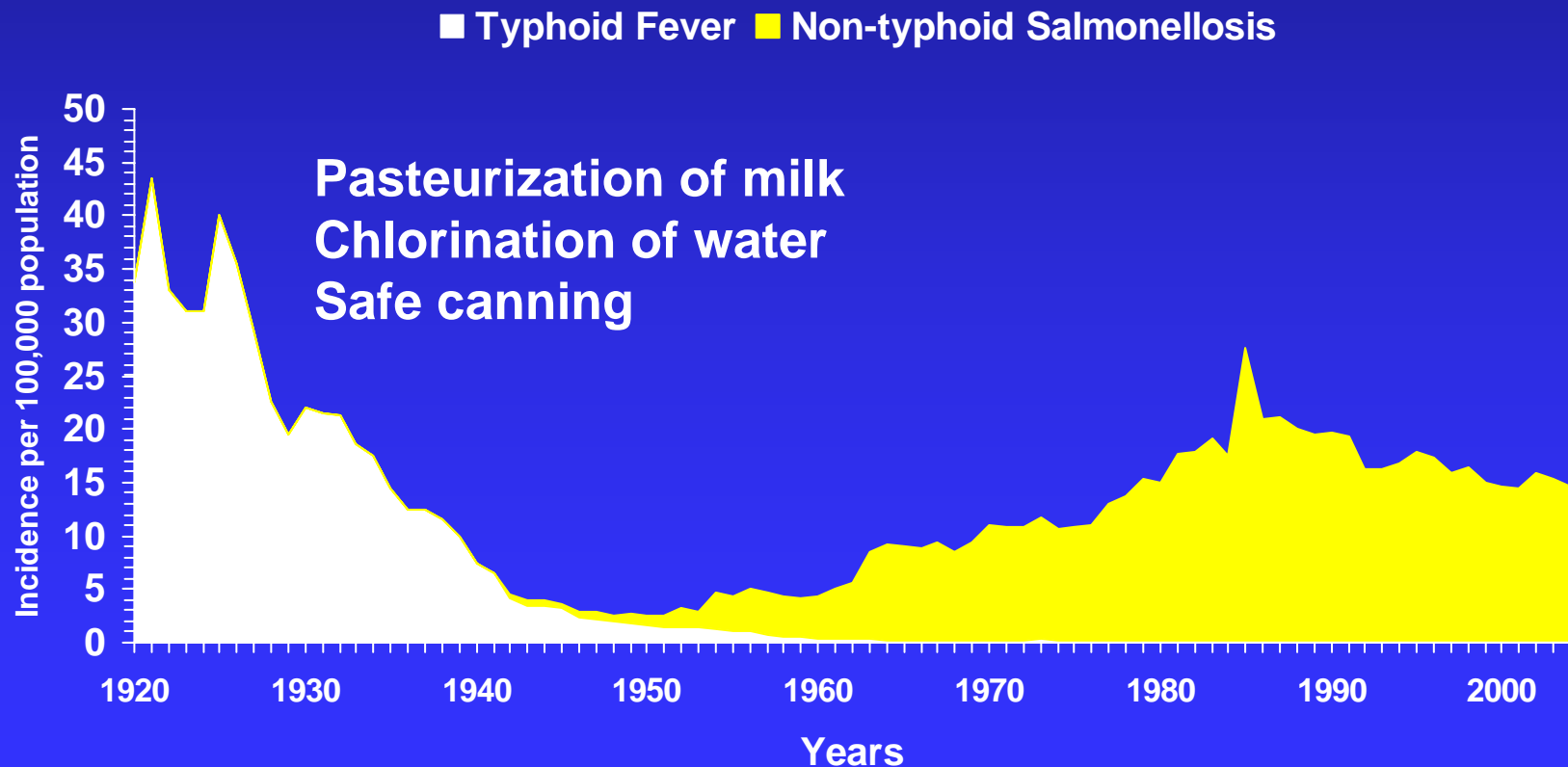
Why do we conduct surveillance?

Surveillance is monitoring linked to action

- Define the current magnitude and burden of a disease we can do something about
- Identify outbreaks, so control actions can be taken
- Measure the impact of control and prevention efforts
- Reassure the public

Routine surveillance: The fall and rise of reported *Salmonella* infections in the United States, 1920-2004

CDC, National surveillance data

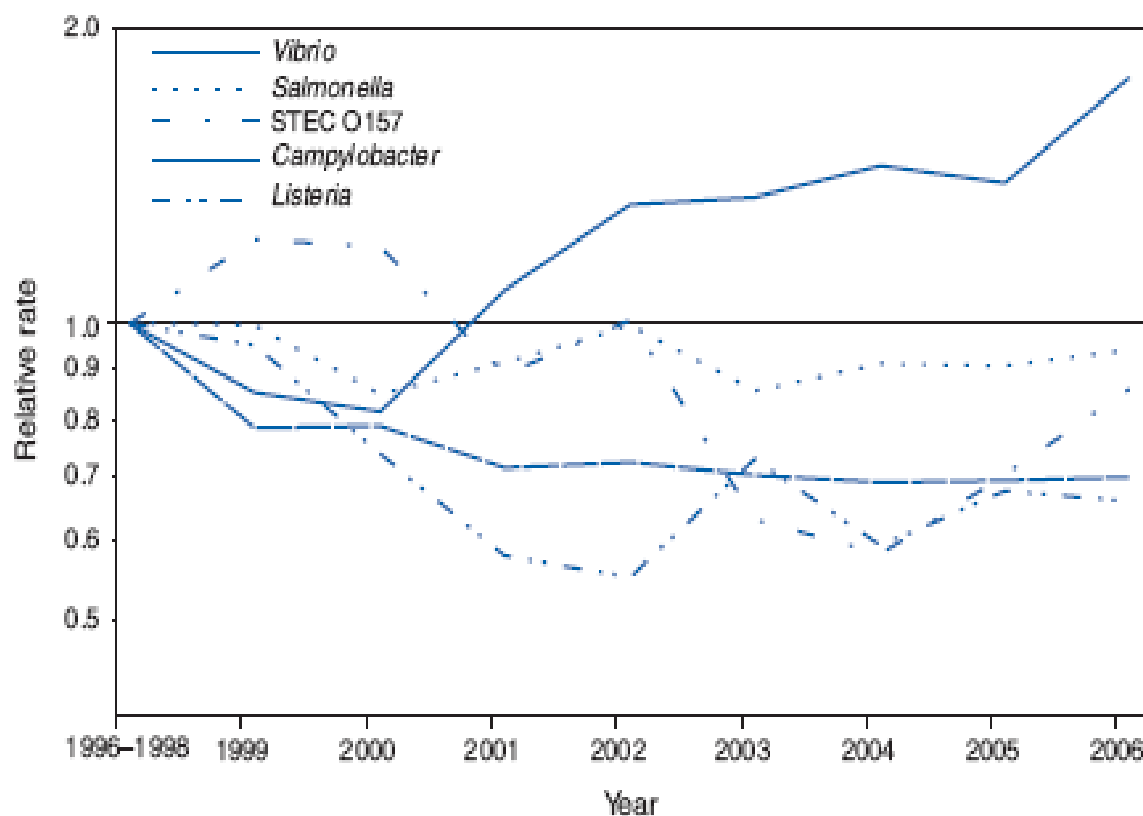


Enhancing surveillance

- Making routine surveillance electronic and swift
- FoodNet: Network of sentinel sites to do detailed active surveillance to determine burden and source, and population surveys of knowledge and practices
- PulseNet: Network of Public Health Labs that do molecular fingerprinting of bacteria to detect outbreaks
- NARMS: Network of states to track antimicrobial resistance in enteric bacteria
- Supporting network of public health labs to subtype enteric bacteria, and characterize unusual strains

FoodNet trends 1996-2006

FIGURE 1. Relative rates compared with 1996–1998 baseline period of laboratory-diagnosed cases of infection with *Campylobacter*, STEC* O157, *Listeria*, *Salmonella*, and *Vibrio*, by year — Foodborne Diseases Active Surveillance Network, United States, 1996–2006



* Shiga toxin-producing *Escherichia coli*.

Since 1996-98,
significant
changes in
Infections with:

***Vibrio* + 78%**

***Campylobacter* - 30%**

***Listeria* - 34%**

***Shigella* - 35%**

***Yersinia* - 50%**

*No significant change
in: E. coli O157,
Salmonella*

MMWR 2007; 56:336-339 (April 13, 2007)

Why do we investigate outbreaks?

- Prevent additional cases in the current outbreak
- Learn to prevent future similar outbreaks
- Learn about a new disease
- Learn something new about an old disease
- Reassure the public
- Minimize economic loss

Better surveillance with PulseNet reveals a new outbreak scenario

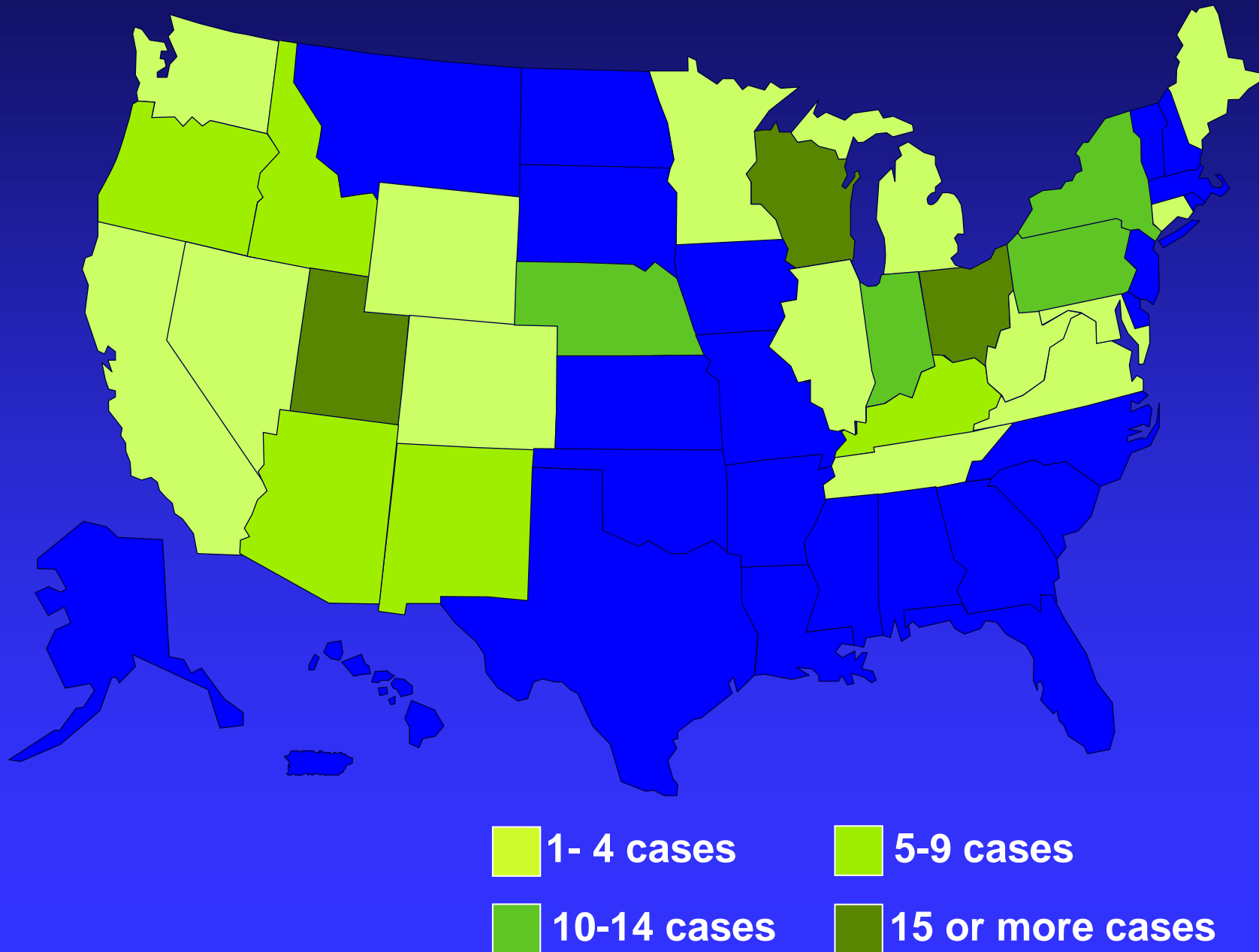
Old scenario:

- Acute local outbreak
- High dose, high attack rate
- Detected by group themselves
- Local investigations
- Often a local food handling error, often egregious
- Local solution

New Scenario:

- Diffuse widespread outbreak
- Low dose, low attack rate
- Increase in "sporadic" cases in many places at once
- Detected by PulseNet
- Complex multistate investigation
- Industry-wide implications

205 Cases of *E. coli* O157:H7 Infection in 26 States



Enhancing outbreak investigations

- **Expanding the goals of investigation:**
 - | Beyond just implicating the potato salad
 - | How contamination occurred, and how to prevent it
 - | Rapid action to protect public health based on good epidemiologic data
- **Enhancing the toolkit of methods:**
 - | OutbreakNet: network of state partners
 - | Standard questionnaires, approaches
 - | PulseNet routine part of many investigations
 - | Training in methods (Epi-Ready)
- **Council to Improve Foodborne Outbreak Response (CIFOR)**
 - | Close coordination across agencies
 - | Working with industry as partner

Enhancing applied research

- Defining new and emerging pathogens
- Identifying risk factors and protective effects for sporadic cases of foodborne diseases
- Attributing the burden of foodborne diseases to specific types of foods
- Providing the tools needed for better surveillance, investigation and prevention
- Laying the ground work for better prevention strategies

Enhancing prevention of foodborne diseases from farm to table (Many players)

- Better process control from farm to table
 - On farm sanitation and other good agric. practices
 - Prudent antimicrobial use
 - Making food processing microbiologically sound
 - Food factory HACCP
 - Refrigeration during shipping
- Final processing kill step critical for some foods
 - Pasteurization and other heat treatments
 - Pressure treatment of oysters
 - Gamma and electron beam irradiation
- Better education
 - Foodhandler training and certification
 - Food safety for consumers

Final thoughts

- Foodborne diseases remain a challenge to public health
- Most foodborne diseases are preventable
- Preventing these diseases requires a "farm-to-table" strategy with multiple control steps
- New challenges arise
- New surveillance strategies are increasing capacity to detect and trace outbreaks
- Better prevention and control is needed to reach national goals

Thank you



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Mission of the Foodborne and Diarrheal Diseases Branch, DBMD

- **To prevent illness, disability and death due to bacterial foodborne and diarrheal diseases in the United States and abroad.**
- **We accomplish this by continually improving surveillance, outbreak response, applied research, training and education.**
- **We identify causes and sources of bacterial foodborne and diarrheal illness to develop new prevention and control methods.**
- **We are an independent risk identification agency. We work in partnership with other public health agencies, regulatory agencies, and with other public and private organizations, to achieve prevention.**
- **Our hallmarks are close collaboration between epidemiologists and microbiologists, rapid response to urgent new problems, objective scientific investigations, support of and collaboration with State Health Departments , and targeted prevention efforts.**

Foodborne diseases: Philosophy of prevention

- **No vaccines for most of these pathogens**
- **Educating consumers, foodhandlers and producers is important, but not sufficient**
- **Contamination can occur from farm to table**
- **Understand mechanisms of contamination well enough to prevent it upstream from the consumer**
- **Use outbreaks and other investigations to learn how to prevent disease, through targeted prevention strategies**
- **Re-engineering food production processes and policies for safety**

Enhancing prevention of bacterial diarrheal disease around the world

- Much is waterborne; Prevention = clean drinking water
 - Safe water unavailable to most of world
 - Home based chlorine disinfection reduces illness 40%
 - For muddy water, additional step needed to clear turbidity
 - Sustainable marketing strategies exist and are critical.
- Foodborne disease is largely unrecognized
 - Lab surveillance starts with Salmonella (WHO Global Salm Surv)
 - Use the data to find the problems and fix them (FETP)
 - The future for many countries will include pasteurization of milk, treatment of sewage and sanitary slaughter (our battles of the early 1900's in the US)
- Some is prevented by better hand hygiene
 - Using soap and water to wash hands reduces illness
 - Strategies to promote handwashing are critical
- Vaccines and vaccine strategies needed for
 - Typhoid fever and shigellosis.

Prime candidates for a definitive food safety processing step - 2004

- *E. coli* O157 in ground beef
- *Campylobacter* in poultry
- *Listeria* in ready to eat meats
- *E. coli* O157 and *Salmonella* in fruit juices
- *Salmonella* Enteritidis in shell eggs
- *Vibrio vulnificus* in oysters
- Irradiation
- Irradiation
- Post packaging heating/ Irradiation
- Pasteurization/Irradiation?
- In shell pasteurization
- In shell pressure treatment

There is a new investigative strategy

Old strategy:

- Culture all the leftovers
- Have to find the pathogen in the food to take action
- Assume someone broke the rules
- Goal: Assign blame
- Treat industry is a perpetrator
- Be sure your evidence holds up in court

New strategy:

- Develop and test hypotheses
- Interview ill and well
- Look for the difference in exposure between them
- Take action on statistics
- Goal: Figure out how to prevent it from happening again
- Treat industry as a collaborator
- Be sure your data are scientifically valid

Foodborne diseases: what are the new issues?

- **Microbial change:**
 - New pathogens
 - Pathogens we didn't know were foodborne
 - Antibiotic resistance increasing
- **Societal change:**
 - Larger population at risk
 - Global food supply
- **Technological change:**
 - New technologies can open up new niches
 - Minimally processed foods with fewer barriers
- **Regulatory change:**
 - New solutions sought
 - New flexibility in regulatory agencies